

REMARKS

Amendments to the Claims

Claim 1 has been amended to specify that the centraliser is adapted to expand radially from a non-expanded configuration to an expanded configuration. Basis for this amendment can be found in original claim 2.

Claim 1 has also been amended to specify that the centraliser has at least one blade that projects radially from the body in the non-expanded configuration. Basis for this amendment can be found in original claim 5.

Claim 1 has also been amended to specify that the slots are provided in the body of the centraliser and that the slots are adapted to deform during expansion of the centraliser. Basis for this amendment can be found on page 6, lines 15 to 26 of the PCT application as originally filed, which discloses that on expansion, the sides of each slot are pushed apart, widening the slots.

Corresponding amendments have been made to the remaining claims; in particular, original claim 5 has been cancelled, part of original claim 2 has been deleted, and the remaining claims have been consequently renumbered.

Claims 21 to 24 are new.

New claim 21 is directed to an expandable casing centraliser having an array of deformable slots in the body of the centraliser, at least one slot being axially spaced relative to another slot. Basis for this amendment can be found in original claim 1 and page 2, lines 16 to 27 of the PCT application as filed.

New claim 22 specifies that at least one slot is circumferentially spaced relative to another slot. Basis for this amendment can be found in page 2, lines 16 to 27 of the PCT application as filed.

New claim 23 has basis in original claims 2 and 5.

New claim 24 has basis in original claims 9, 5, 2 and 1.

No new matter has been added.

Objections

Claims 1-20 were objected to the office action. These claims have now been amended. Reconsideration and withdrawal of the objections to these claims is respectfully requested.

35 USC 102 and 35 USC 103 Rejections

Bailey (US 6,098,717)

Claims 1-4, 10, 12, 14, 15, 17-20 have been rejected under 35 USC 102(b) as being anticipated by Bailey et al (US 6,098,717).

Amended claim 1 now specifies a centraliser that has at least one blade that projects radially from the body in the non-expanded configuration.

In contrast, Bailey does not disclose a centraliser that has a blade that projects radially from the body in the non-expanded configuration. The Examiner has identified the tubular body 18 of the spacer 16 as a centraliser. However, the body 18 is not a centraliser and does not have a blade. Instead, the body 18 has a uniform outer diameter in both the non-expanded configuration (see Fig 1) and the expanded configuration (see Fig 2).

Since Bailey lacks at least two features (the centraliser and the blade) when compared to amended claim 1, it is respectfully submitted that the claim is novel over Bailey. In the first place, it must be acknowledged that Bailey does not describe a centraliser at all, but a spacer. The spacer is not intended to centralize the liner within the casing, and there is no teaching or suggestion of the act of centralizing the tubular anywhere in Bailey. In fact, as can be seen from Fig 1, there is an deliberate annular gap maintained between the outside of the spacer and the inside of the casing so there is no attempt to influence the position of the inner tubular at all in the unexpanded configuration. Indeed, this gap is necessary for the insertion of the tubular into the casing (see column 5, line 58-60), so it cannot be accepted that the body of the spacer in Bailey is a centraliser at all, and Applicant argues that this feature is missing from the disclosure of Bailey.

Instead, the function of the spacer in Bailey is merely to *adapt* a smaller liner to a larger casing as taught in column 2, lines 33-35, and in column 5, lines 20-23, and to *transfer load* from the expanding liner to the outer casing as taught by column 3 line 41-42. The spacer is expanded by the liner against the wall of the casing, providing a tight seal therebetween (see abstract). The liner is expanded to permanently close the gap between the spacer and the casing (see column 5, lines 52 to 60). The casing expands elastically with the spacer, but when the tubular expander is withdrawn, the casing contracts/shrinks to a greater extent than the liner, so that the liner and spacer is held tightly against the casing (see column 6, lines 1 to 4 and 14 to 18). This creates the tight seal (shown in Fig 2) between the outside of the spacer and the inside of the casing.

Secondly, the claimed feature of the radially extending blade is missing from Bailey. The main advantage provided by the blade that extends in the *non-expanded* configuration in the claimed centraliser is that it helps the tubular to avoid problems with differential sticking during insertion into a wellbore. Differential sticking can occur if the hydrostatic pressure in the borehole rises above the pressure in the formation, causing the tubular to be sucked laterally against one side of the borehole by the pressure differential. This decentralizes the tubular, which itself is undesirable, but also the high surface area of the tubular that is held against the borehole wall prevents the tubular from moving within the borehole, causing it to stick in place, and requiring remedial action to move it.

The blade now claimed mitigates differential sticking of the tubular in a porous formation, because the lateral suction force caused by the pressure differential can only act on the relatively lower surface area of the radially extending blade that is in contact with the borehole wall. Therefore, the total lateral force that is applied to the tubular in zones of high pressure differential is reduced, and the tubular is less likely to become decentralized or differentially stuck.

A skilled person would not modify Bailey's optional spacer to introduce a radially-extending blade as now claimed, because the skilled person would appreciate the great importance of the uniform outer diameter of the spacer in providing a tight seal in the expanded configuration of Fig 2.

Adding radially-extending blades as now claimed to Bailey's spacer would cause significant problems when the spacer was expanded. When expanded, radially-extending blades would cause the problems of:

- a) no seal between the body of the centraliser and the casing, as the body of the centraliser would be held spaced from the casing by the blades;
- b) the blades would dent the elastic casing instead of expanding it uniformly (casing is elastic: see column 6, line 1);
- c) on removal of the tubular expander, the casing would become even more dented but no seal would be formed;
- d) annular gap inside the casing, necessary for placement of the liner (see column 5, lines 58-60) is taken up with the blades and insertion of the liner is made more difficult.

To modify Bailey's design still further to try to overcome these additional problems (caused by adding blades to Bailey's spacer), is getting far beyond a simple modification, obvious to the skilled person from reading Bailey. However, even if the spacer could somehow be modified yet further to achieve this, the blades would have to be arranged to expand less than the rest of the spacer, causing differential expansion of the spacer, and differential forces on the casing, thus damaging the casing and weakening the seal between the spacer and the casing.

Thus, the skilled person would not modify the optional spacer to add blades, as such blades could both damage the casing and prevent/weaken the connection between the liner and the casing. Given that a strong, sealed connection between the liner and the casing is the fundamental aim of Bailey's invention, adding blades to the Bailey's spacer 16 (which is not a centraliser and is not required to perform this function) makes no sense and the skilled person would never wish to do this.

Hence, Bailey actually teaches away from using a spacer having blades, and it would therefore not be obvious to a skilled person to add blades to Bailey's spacer.

Accordingly, it is respectfully submitted that amended claim 1 is inventive over Bailey.

Ducassee (US 6,789,622)

Claims 1, 2, 4, 10, 12-15 and 17-20 have been rejected under 35 USC 102(e) as being anticipated by Ducassee (US 6,789,622).

Amended claim 1 now specifies a centraliser that has at least one blade that projects radially from the body in the non-expanded configuration.

In contrast, Ducassee does not disclose a centraliser that has a blade that projects radially from the body in the non-expanded configuration.

Hence, it is respectfully submitted that amended claim 1 is novel over Ducassee.

Like Bailey, Ducassee also relates to a method of anchoring an expandable conduit to a second conduit in which the expandable conduit is located (see column 1, lines 12 to 15).

The Examiner has identified formation 150 as a centraliser. However, as clearly seen in Fig 3, the formation 150 only projects to a very small extent from the body of the expandable conduit 100; in fact the projection of the formation 150 from the surface 100s is only 3mm (see column 6 line 5) and the depth of the formation is clearly intended to be less than the projection of the pre-expanded portion 100e. Hence, the formation 150 cannot function to adequately centralize the conduit 100 in a borehole as it would not reach the borehole wall, and is not a centraliser.

Instead, formation 150 is designed to grip and/or seal against the inner wall of a casing in which the expandable conduit is inserted (see column 6, lines 6 to 8). The gripping and sealing effect is described at column 5, lines 15 to 22 (the embodiment of conduit 100 functioning in the same way as the embodiment of conduit 12).

Adding a radially extending blade as now claimed to the 3mm deep formation 150 is completely impractical and unworkable. Furthermore, even if this could be done, such a blade would actually prevent the sealing of the expandable conduit against the casing wall, as the blade would hold the non-bladed part of the formation 150 away from the casing wall. Hence, a skilled person would not seek to add a blade as now claimed to the formation 150 of Ducassee, as

this would clearly prevent both sealing and anchoring, against the teachings of Ducasse. Hence, it would not be obvious for a skilled person to add a blade to Ducasse's formation 150.

Accordingly, it is respectfully submitted that amended claim 1 is inventive over Ducasse.

Buytaert (US 2002/0112853)

Claims 1, 2, 10, 11, 12, 14 and 16-20 have been rejected under 35 USC 102(e) as being anticipated by Buytaert (US 2002/0112853).

Amended claim 1 now specifies a centraliser that has at least one blade that projects radially from the body in the non-expanded configuration.

In contrast, Buytaert does not disclose a centraliser that has a blade that projects radially from the body in the non-expanded configuration. As clearly shown in both Figs 1 and 7, the spring blades actually lie flat against the body in the non-expanded configuration. Paragraph 0019 describes how the spring blades are deliberately compressed laterally against the body in the unexpanded configuration so that the device can pass through small openings.

Furthermore, amended claim 1 also now specifies that the slots are provided in the body of the centraliser.

The Examiner is considering that Buytaert's arms constitute blades and the spaces between the arms constitute slots. However, if the arms are the blades, the arms cannot be part of the body because the blades must project from the body. Hence, if the arms are the blades, Buytaert does not have slots provided in the body. Conversely, if the spaces between the arms are "slots provided in the body", this means that the arms must be part of the body. Hence, in this interpretation, Buytaert does not have "at least one blade that projects radially from the body".

Hence, for the above two reasons, amended claim 1 is novel over Buytaert.

The purpose of Buytaert's centraliser is to allow the centraliser to pass through a narrow, upper portion of the wellbore, before being expanded when the centraliser has entered a lower,

wider portion of the wellbore. Hence, the blades must not protrude radially in the non-expanded configuration, or they would get stuck in the narrow, upper portion of the wellbore, actually preventing the string from being lowered.

Thus, it would not be obvious to modify Buytaert's centraliser to include blades that project radially in the non-expanded configuration, as if this were done, the use of such a centraliser would be limited only to bores that are very wide at all parts of the bore, which is clearly against the intention of Buytaert. Hence, such a modification would be very disadvantageous.

Consider now the other difference that Buytaert does not include both slots in the body and a blade that projects radially from the body. The slots in the body allow the centraliser to be used with expandable tubing.

The inner diameter of Buytaert's centraliser is fundamentally fixed by the solid collars 20, so Buytaert's centraliser could not be used on the outer surface of a section of expandable tubing without breaking the centraliser. Although the arms can increase their outer diameter, there is no possibility of increasing the diameter of the collars 20 that hold the arms, and hence no possibility of increasing the minimum inner diameter of the centraliser. There is no hint or suggestion in Buytaert to modify the centraliser for use with expandable tubing; thus the skilled person would have no reason to do this.

It would not be obvious to introduce deformable slots into the solid collars (to introduce slots in the "body"), as this would weaken the collars. Furthermore, it would not be obvious to add a blade that extends radially outward of the arms (if the arms are considered as part of the body), as the arms are relatively thin and might not support such a blade, and because the arms already perform the centralising function, so there is no need for blades that extend further from the arms.

Thus, it is respectfully submitted that amended claim 1 is inventive over Buytaert.

Royer (US 5,785,125)

Claims 1-3, 5-8, 10-12, 14, 16 and 18 have been rejected under 35 USC 102(b) as being anticipated by Royer.

Amended claim 1 now specifies that the slots are provided in the body of the centraliser, and that the centraliser has a blade that projects radially from the body in the non-expanded configuration.

In contrast, the Examiner has considered that Royer's arms constitute "blades" and the spaces between the arms constitute slots, similar to the interpretation for Buytaert. However, Royer, like Buytaert, does not have both slots in the body and a blade that projects from the body, for the same reasons as given above with respect to Buytaert.

Accordingly, amended claim 1 is novel over Royer.

The differentiating feature of slots provided in the body allows the centraliser of amended claim 1 to be used with expandable tubing.

Like Buytaert, the minimum diameter of Royer's centraliser is fundamentally fixed, because the collars which hold the arms are non-expandable, so Royer's centraliser could not be used with expandable tubing without breaking the centraliser (see above reasoning relating to Buytaert). There is no hint or suggestion in Royer to modify the centraliser for use with expandable tubing, and thus the skilled person would have no reason to do this.

Thus, it would not be obvious to modify Royer's centraliser to introduce deformable slots in the collars, or add a blade to the arms, because (1) adding slots would weaken the collars and (2) the arms are totally unsuitable for supporting a blade.

Thus, amended claim 1 is inventive over Royer, for the same reasons as given above for Buytaert.

Lauritzen (US 6, 662, 876)

Claims 1-4, 10, 12, 14, 15 and 17 have been rejected under 35 USC 102(e) as being anticipated by Lauritzen.

Amended claim 1 now specifies that the centraliser includes a blade that projects radially from the body in the non-expanded configuration.

In contrast, Lauritzen's invention relates to apparatus for expanding tubulars to seal an annular area in a wellbore (see abstract).

Lauritzen does not disclose any form of blade on the tubular 420a or the sleeve 425, and is allowable for the above reasons, discussed with respect to Bailey and Ducasse.

Additionally, any skilled person tempted to modify Lauritzen's sleeve 425 to introduce a radially-protruding blade, would realise that this would impair the ability of the sleeve 425 to seal against the casing (see Figs 4a to 4c). The radial blades would contact the casing before the rest of the body of the centraliser, damaging the casing, and impairing the sealing ability. Thus, such a modification would act against the desired aims and teaching of Lauritzen; thus such a modification would clearly make no sense.

Hence, it is submitted that amended claim 1 is inventive over Lauritzen.

Simpson (US 6, 899, 181)

Claims 1, 2, 4-8, 10-12, 14, 15 and 17 have been rejected under 35 USC 102(e) as being anticipated by Simpson.

Firstly, the Examiner has interpreted the groove 504 as a slot. However, the Applicant respectfully submits that the groove 504 is not a slot, because "slot" necessarily implies an aperture. Since Simpson does not disclose a centraliser body having an aperture, Simpson's tubular 500 does not have a "slot".

Secondly, claim 1 has been amended to specify that the slots are in the body of the centraliser. Even if Simpson's grooves could be interpreted as slots (which is denied, as above), these are not slots in the body, but merely gaps between the blades. Hence, Simpson does not disclose "slots in the body".

Thirdly, since Simpson does not disclose a centraliser having a slot, it necessarily follows that Simpson does not disclose slots that are adapted to deform during expansion of the centraliser.

Fourthly, Simpson does not disclose a “centraliser”. An important function of a centraliser is to centralise a tubular in the middle of a borehole, by contact between a part of the centraliser and the borehole wall. In contrast, Simpson describes “apparatus for separating and joining tubulars in a wellbore” (see column 1, lines 20 to 21). As explained in column 10, lines 20 to 25, the formations only come into contact with the larger diameter tubular after the smaller diameter tubular has been expanded. Before expansion, there must be a gap between the formations and the larger diameter tubular, so the formations cannot act to centralise the tubular. This gap is vital to Simpson, as without it, the high friction formations would grip the larger diameter tubular and prevent the smaller diameter tubular from being lowered into the well (as explained in more detail below). Hence, Simpson’s formations do not centralise the smaller diameter tubular as, by necessity, they must not project far enough from the body of the tubular to achieve this, so Simpson does not disclose a “centraliser”.

Hence, amended claim 1 is novel over Simpson, for at least the four reasons above.

Simpson’s device is a sealing device for tubulars. The tubulars may be those used in drilling an oil well (see column 1, lines 34 to 36). When drilling an oil well, drilling fluid passes down the centre of the tubular to the drill bit. It would make no sense to cut slots into the tubular body 500, because then the drilling fluid would leak out of the tubular 500 and would not reach the drill bit, preventing or at least severely impairing the drilling. Hence, it is vital that the tubular body 500 does not have slots, and the skilled person would never consider adding slots into the tubular body 500.

Furthermore, it would not be obvious to modify Simpson’s sealing device to turn it into a centraliser. As explained above, Simpson is not a centraliser as no part of Simpson is designed to contact the larger tubular before expansion. In contrast, Simpson relies on the presence of a significant gap between the formations and the larger tubular, pre-expansion. This is because Simpson’s formations are very high friction (see column 10, lines 4 to 8). This passage describes

that the formations have teeth that increase frictional resistance to downwards movement. Hence, it is vital that Simpson's formations *do not* contact the larger tubular before expansion, as if so, the smaller diameter tubing would become stuck in the larger diameter tubing, preventing the smaller diameter tubing from being lowered into the well.

Hence, amended claim 1 is inventive over Simpson.

Rejection under 35 U.S.C. §103 to claim 13

As argued above, amended claim 1 is novel and inventive over all of the prior art. Claims 2 to 20 (including claim 13) are all dependent on claim 1, and so these claims are also novel and inventive, at least by this dependency. Hence, the Examiner's objection to claim 13 as unpatentable over Bailey in view of Metcalfe (US 6,065,500) is no longer relevant to the patentability of claim 13.

New claims 21 to 23

New claim 21 relates to a casing centraliser.

Bailey does not disclose a casing centraliser, because Bailey's spacer 16 is located inside casing 10. Hence, Bailey's spacer cannot possibly centralise the casing itself.

Ducasse does not disclose a casing centraliser, because Ducasse's formation 150 is located inside casing 14. Hence, Ducasse's formation cannot possibly centralise the casing itself.

Lauritzen does not disclose a casing centraliser, because Lauritzen's sealing apparatus is located inside casing 460. Hence, Lauritzen's formation cannot possibly centralise the casing itself.

Simpson does not disclose a casing centraliser, because Simpson's tubular 500 (e.g. for drilling) is for location inside casing. Hence, Simpson's tubular 500 cannot possibly centralise the casing itself.

It is submitted that there is no motivation in any of these documents (or the art as a whole) to modify any of these pieces of apparatus (all designed for tubulars that are located inside casing), to centralise the casing itself. Indeed, many of these are not centralisers at all,

but merely apparatus for sealing a drillstring/other small tubular against the inside of a casing. Casing is completely different from drillstring and these other tubulars, and has completely different sealing/centralising requirements. For example, providing a sealing device for the annulus between the casing and the wellbore is not necessary because this annulus does not provide a flowpath, and is instead filled with cement. Furthermore, drillstring engineers and casing engineers are completely different people. Although drillstring operations may fail without dire effects, if casing fails, this could ruin the entire well. Hence, the arts of drilling and casing are completely different, and a product suitable for one is not generally transferable to the other. Thus, the person skilled in the art of casing centralisers would not even consider any of the above documents as a starting point for designing an improved casing centraliser.

Hence, new claim 21 is novel and inventive over Bailey, Ducasse, Lauritzen and Simpson, whether read alone or in combination with each other.

New claim 21 specifies that the casing centraliser has an array of deformable slots in the body of the centraliser, at least one slot being axially spaced relative to another slot.

Both Buytaert and Royer disclose casing centralisers, and the Examiner has expressed the opinion that the spaces between the arms are “slots”. However, Buytaert and Royer only have one row of slots, and neither discloses an array where one slot is axially spaced relative to another slot.

The advantage of an array of slots, at least two of which are axially spaced relative to each other, allows the use of slots that are significantly shorter than the length of the centraliser itself. This covers embodiments, such as those of the drawings of the application in suit, where the slots form an expandable mesh structure. Such a structure is strong and allows each part of the centraliser to expand to an appropriate extent depending on the forces on that particular part. Such an expandable mesh structure also allows the entire centraliser body to expand (to allow expansion from within). Hence, the invention of claim 21 can be used with expandable tubing, which is completely impossible for both Royer and Buytaert, in which “expansion” only involves extension of the arms whilst retaining the same minimum diameter of the centraliser.

There is no hint or suggestion to modify either of Buytaert or Royer's centralisers for use with expandable tubing, and both of these are very clearly and fundamentally designed for non-expandable tubing. Furthermore, since the "slots" are the gaps between the arms, introducing another axially spaced slot would require adding a second row of arms, which:

- a) provides no advantage;
- b) still would not enable these centralisers to be used with expandable tubing;
- c) would increase the chances of one of the rows of arms becoming stuck on expansion or contraction; and
- d) would double the length of the centraliser or halve the extension capability of the arms.

Hence, such a modification makes no sense, and the skilled person would never wish to do this.

In light of the above, it is respectfully submitted that new claim 21 is both novel and inventive over Buytaert or Royer. Since new claims 22 and 23 are dependent on claim 21, these claims are also novel and inventive, at least by this dependency.

New claim 24

The Examiner remarked that claim 9 would be acceptable if re-written in independent form with all of the limitations of the base claim and any intervening claim. Accordingly, new claim 24 has basis in former claim 9, the base claim 1 and intervening claims 2 and 5, and is therefore believed to be allowable.

Based on the foregoing, reconsideration and withdrawal of the rejections and abjections is respectfully requested.

It is, thus, believed that the application is now allowable and notification to this effect is earnestly solicited. Should the Examiner have any questions or comments regarding Applicants' amendments or response, he is asked to contact Applicants' undersigned representative at (215) 988.3303. Please direct all correspondence to the below-listed address. If there are any fees due

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in connection with the filing of this response, please charge the fees to our Deposit Account No. 50-0573.

Respectfully submitted,

A handwritten signature in black ink, appearing to read 'Robert Cannuscio', written over a horizontal line.

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